

Lesson 5



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Cause and Effect?

Students have learned how human-caused changes in ecosystems affect the organisms living there. This lesson provides students the opportunity to apply their knowledge about how human practices may have caused changes in the wolverine's habitat.

Students review the natural history of the wolverine and read Part 2 of *Where Are the Wolverines?* In groups, they study fragments of information that describe one human use of the ecosystem in which wolverines once lived. Students write a brief sum-

mary of their group's information and present their piece of the puzzle to the class. They discuss which changes may have had a role in the decline of the wolverine population. Students complete a study guide further exploring the causes and effects of

human practices on natural systems. Finally, they discuss human actions, their unintended consequences, and the importance of examining possible effects before making changes in an ecosystem.



Ranchers set out poison to kill wolverines and any other predators that might attack livestock. Wolverines fed on animals, such as fox and beaver, caught in traps. Trappers also set out poison bait to kill wolverines that raided their traplines. Evidence suggests that poisoning by ranchers and trappers may have been a main cause of the loss of the wolverine population in the Sierra, but other factors were also important.



Background

Over the past 200 years, numerous and varied changes have occurred in the natural habitat of wolverines in California. Those changes coincided with the decline in the wolverine's population. Since the habitat changed so much and for so many different reasons, one cannot say that any single change caused the decline in numbers of wolverines. However, changes in or loss of habitat cause most extinctions.

The influx of people into the Sierra Nevada Mountains in the late 1800s affected the populations of prey species such as deer, a mainstay of the wolverine diet. Just what the net effect was is not easy to determine. While the new settlers certainly killed deer

for food, they also killed animals such as mountain lions that competed with wolverines. In some areas, logging that opened up the forest may have increased deer populations by creating new areas for preferred foods such as grasses.

Wolverines lived primarily in higher elevations where people have had less influence on the environment. At these elevations, the scarcity of food for a large carnivore meant that wolverines needed to range over a large area to meet their needs. As roads, ski slopes, and settlements fragmented their habitat, it became increasingly difficult for wolverines to find food while avoiding humans.

In the 1800s, ranchers began grazing sheep in the higher elevations.

Learning Objective

Describe the effects of human practices on the transfer of matter through natural systems.



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Key Vocabulary

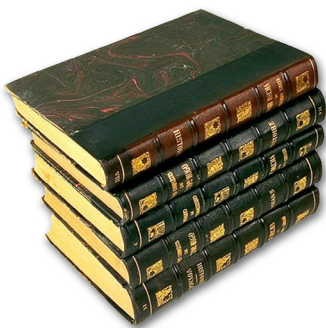
Extinct: Death of every member and population of a species.

Toolbox



Summary of Activities

Students read *Where Are the Wolverines?—Part 2.* In groups, they review information about changes in the Sierras over the last 200 years, present summaries about causes and effects of environmental change, and discuss the difficulty in ascribing a given change to a single cause.



Instructional Support

See Unit Resources, page 21

Prerequisite Knowledge



- Students should understand that humans obtain many products from and engage in many uses of forests. Obtaining those products affects the environment in many ways, including the transfer of matter through natural systems.
- Students should be familiar with the natural history of the wolverine. (See *Where are the Wolverines?—Part 1.*)

Advanced Preparation



Make copies:

Make copies as indicated in the Activity Masters section below.

Prepare puzzle pieces:

Copy the puzzle pieces onto cardstock. (optional) Cut apart the puzzle piece cards to create one class set.



Materials Needed



Activity masters:
See below

Visual Aids



No visual aids are required
for this unit.

Duration



Preparation time:
15 min.
Instructional time:
45-60 min.



Safety Notes
None

Activity Masters



**Cause and Effect
Puzzle Pieces**
Page 81
One set per class



**Where are the
Wolverines? -
Part 2**
Page 86
One per student



**Cause and Effect
Study Guide**
Page 87
One per student

Procedures

Step 1

Review the natural history of wolverines as presented in **Where Are the Wolverines? - Part 1** (Lesson 1 Activity Master).

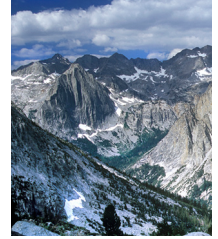
Step 2

Remind students that scientists have considered the decline of the wolverine to be somewhat of a mystery. They have conducted studies to try to determine what may have caused the wolverine to markedly decline or virtually disappear from the Sierra Nevada Mountains. Point out the meaning of extinction by writing the definition on the board. Challenge the students to help scientists solve this puzzle. Ask, “Although extinctions happen naturally, what kinds of human practices might cause an animal like the wolverine to become extinct in the Sierra Nevada Mountains?” List students’ ideas on the board.

Step 3

Organize students into groups of two or three. Give each group one of the **Cause and Effect Puzzle Pieces** (Lesson 5 Activity Master). Explain that each puzzle piece describes changes in the Sierra Nevada Mountains during the past 150 years. Ask groups to read the information on their puzzle piece and work together to prepare and present a brief summary to the rest of the class. The summary should:

- describe the change
- answer the question, “Could this change be the reason for the overall decline of the wolverine population in the Sierra Nevada Mountains?”
- explain students’ rationale for their choice



Step 4

Have each group present their brief summary of their puzzle piece and explain their reasoning as to whether their particular change might or might not have caused the wolverines to become extinct in the Sierra. Record the results and brief rationales on the board.

Step 5

Distribute copies of *Where are the Wolverines?—Part 2* (Lesson 5 Activity Master). Read the story and discuss the changes that have occurred in the wolverine's habitat over the past 150 years. (Logging, development for housing, roads, and grazing of sheep and cattle) Combine the existing small groups into groups of four to six students. Ask the new groups to compare the explanation in the story to the class results posted on the board. Discuss reasons for any differences. Bring the class together and briefly share and discuss insights as to what happened to the wolverine in the Sierra Nevada Mountains. Conclude by pointing out that human practices often result in loss of habitat for other species. The habitat loss can interrupt the flow of matter through natural systems. Explain that loss of habitat is the leading cause of extinction, and the primary reason species populations become threatened or endangered. Human practices that are not well thought through sometimes have unintended consequences and affect wildlife and habitats more than anticipated. Ask for ideas on how the decline in wolverine population might have been avoided.

Lesson Assessment

Instructions

Description:

The EEI Learning Objective for Lesson 5 requires students to describe the effects of human practices on the transfer of matter through natural systems. Students will use *Where Are the Wolverines?—Part 2* (Lesson 5 Activity Master) to answer the **Cause and Effect Study Guide** (Lesson 5 Activity Master) and demonstrate their understanding of the influences of human practices on the flow of energy through natural systems.

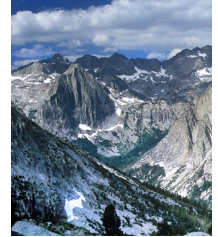
Instructions:

Distribute the **Cause and Effect Study Guide** in class or for homework. Check that all students have a copy of *Where are the Wolverines?—Part 2*. Instruct students to use the information in the reading to answer the questions on the **Cause and Effect Study Guide**. Collect student work.

Suggested Scoring

Scoring Method:

Samples answers for the **Cause and Effect Study Guide** are provided on page 59.



Cause and Effect Study Guide Sample Answers (Lesson 3 Activity Master)

1. Describe how each of the following activities might have contributed to the decline of the population of the wolverines and how each might benefit people?

Example:

Activity	Possible Contribution to the Decline of Wolverine	Potential Benefits to People
Deer hunting	<i>Deer hunting reduced an important winter food source for the wolverines.</i>	<i>Deer hunting provided a recreation and food for families.</i>
Highways connecting California and Nevada	<i>Many more people traveled between the states. The roads cut through wolverine habitat and affected where they could live.</i>	<i>It was easier for people to travel between the states for travel for work and recreation.</i>
Logging	<i>Logging reduced the areas where wolverines could live.</i>	<i>There were more jobs and it provided building materials.</i>
Mining for gold	<i>Large amounts of soil washed into mountain streams.</i>	<i>Gold mining bought miners and early settlers to the area. New towns were built and new industries were started.</i>
Wearing wool clothing	<i>Wolverines lived in higher grasslands where ranchers grazed sheep. They poisoned wolverines to protect their livestock.</i>	<i>Wool from sheep was used in California and other states to make warm clothing.</i>

2. Human activities like logging and building roads influence natural systems. Provide two examples of how logging and building roads influence natural systems. Provide two examples of how people benefit from logging and building roads. (1 point per answer)

Logging and building roads can cause habitat loss and the construction of road can block the paths animals cross as they move throughout their range. Logging provides lumber for people to construct buildings and building roads makes it easier for people to travel to different areas.

3. Logging in the Sierra increased at the same time the wolverine population decreased. Does this prove that the logging caused the decline of the wolverine; that is, was this a cause-and-effect relationship? Why or why not? (2 points)

No. No one thing caused the wolverines to disappear from California's mountains. A combination of factors caused their decline.

4. Describe two effects of human practices that change how energy moves through natural systems. (2 points)

Building new housing can take away grasses. If rabbits do not have enough food and move away, there will not be enough food for animals like foxes that eat rabbits. This has an effect on how energy moves through natural systems.

If new roads are not carefully built, chemicals can wash into the water killing organisms like insects. When insects die it affects their flow of energy to other consumers.

Flowering plants are producers. When they are removed from an area, a food supply is removed for insects like bees. If bees do not have flowers to visit and eat and pollinate, there will be fewer plants as a food supply.